

## RICERCHE

# Moral Decision-making as Compared to Economic and Shopping Contexts. Gender Effects and Utilitarianism

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Ricevuto: 29 novembre 2018; accettato: 29 marzo 2019

**Abstract** How do people make decisions? Previous psychological research consistently shed light on the fact that decisions are not the result of a pure rational reasoning, and that emotions can assume a crucial role. This is particularly true in the case of moral decision-making, which requires a complex integration of affective and cognitive processes. One question that is still open to debate concern the individual factors that can affect moral decisions. Gender has been consistently identified as a possible variable of interest for the adoption of different strategic behaviors, with men using more rational processes and women more deontological principles. In the present study we aimed at exploring the presence of gender differences in different decision-making scenarios. Results showed that the moral scenario led to a similar acceptance rate in both genders, while economic and shopping offers were more likely to be accepted by men. Also, women were more inclined to refuse unfair offers, which included a higher personal benefit at the expense of the opponent, even if this meant a total loss for both parties. Finally, correlational analyses revealed a different relation between risk propensity and decision-making in men and women in different scenarios.

**KEYWORDS:** Decision-making; Utilitarianism; Altruism; Moral Decision-making; Economic Decision-making

**Riassunto** *Decisioni morali, economiche e d'acquisto a confronto. Effetti di genere e utilitarismo* – Come prendiamo le decisioni? La letteratura psicologica disponibile ha chiarito in ampia misura come le decisioni non siano il risultato di un ragionamento puramente razionale e che le emozioni possono assumere un ruolo cruciale. Questo è particolarmente vero nel caso delle decisioni morali, che richiedono una complessa integrazione tra processi affettivi e cognitivi. Una questione ancora aperta riguarda i fattori individuali che possono incidere sulle decisioni morali. Il genere è stato identificato come una possibile variabile da considerare rispetto all'adozione di comportamenti strategici differenti, in cui gli uomini sembrano più inclini a far uso di processi razionali e le donne a considerare principi deontologici. In questo lavoro abbiamo provato a esplorare la presenza di differenze di genere in diversi contesti decisionali. I risultati hanno mostrato come in ambito morale entrambi i generi siano portati ad accettare opzioni simili, mentre offerte economiche e commerciali sono accettate in misura maggiore dagli uomini. Le donne sarebbero più inclini a rifiutare offerte inique che comprendono benefici personali maggiori a discapito di una controparte, anche se questo implica una perdita totale da ambo le parti. Infine, le analisi correlazionali hanno mostrato una diversa relazione tra propensione al rischio e processi decisionali tra uomini e donne in contesti diversi.

**PAROLE CHIAVE:** Processi decisionali; Utilitarismo; Altruismo; Processi decisionali morali; Processi decisionali economici

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*How do people make decisions? How do they sift through the information without drowning into a sea of alternatives and which are the factors that lead them into a certain direction?*<sup>1</sup>

THE THEORY OF DECISIONS OWES its development to the members of different disciplines such as philosophers, mathematicians, psychologists, sociologist, economists, etc. Each of those disciplines has emphasized a special aspect of decision-making. As well-known, decision theories are usually categorized into descriptive<sup>2</sup> and normative<sup>3</sup> ones. The formers are based on empirical observations and on experimental studies about choice behaviors, whereas the latter assumes that humans should behave as rational decision-makers, who follow well-defined preferences according to certain axioms.<sup>4</sup>

The process underlying rational choices requires that the subject would be able to determine a set of actions, to identify a relationship that links actions to their consequences, to order all possible consequences and to choose the best action. Nevertheless, decisions cannot be considered only as the result of a pure rational reasoning. In fact, emotions assume a crucial role in this process and some decisions cannot be separated from their emotional component.

This is what happens in moral decisions and that is the reason why the study of moral choices represents a powerful tool to investigate the relationship between decision-making and emotions.

### Moral decision-making

Moral judgments have a crucial role in social behavior. People constantly assess their own and other's behavior and try to adjust their actions into what is considered to be "morally right". Indeed, moral decision-making could be described as the complex integration of affective and cognitive processes.<sup>5</sup> It includes decisions that are general-

ly accepted and norms of behavior that are culturally shaped.<sup>6</sup> Furthermore, those decisions with possible harmful effects over someone else have also socially negative outcomes that could even lead to legal consequences.

Over the years, philosophers have been thinking about the origins of morality and about which are the determinant factors of morality, whereas psychologists have mostly focused on the inspection of the mental processes underlying the complexity of moral behavior. In particular, neuroscientific research has mainly investigated the presence of specific neural networks devoted to moral reasoning. In fact, thanks to the development of neurocognitive sciences, the interrogative about how we make moral choices has expanded to the study of which neurobiological correlates and which brain mechanisms underlie moral behavior.<sup>7</sup>

For example, though the study of neurotransmitters and hormones specifically involved in moral decision-making have not found solid evidence yet, it has been proven that oxytocin influences cognitive and emotional processes which are relevant for moral judgment, and this fact may also explain the partial heritability of moral patterns.<sup>8</sup> Indeed, it is rather reasonable to hypothesize that genetic variations on oxytocin pathway contribute to individual differences in moral judgments.<sup>9</sup>

Other important non-invasive in-vivo studies on humans about the morphological and functional brain architecture have been conducted.<sup>10</sup> For example, it has been discovered that dopamine affects several aspects of social behavior that are essential for moral choices such as motivation, reward, reinforcing learning, altruism, and empathy.<sup>11</sup> For example, a study by Pellegrini and colleagues,<sup>12</sup> explored the relationship between genotype and the attitudes toward moral dilemmas. By genotyping five genetic variants of the dopaminergic pathway in 200 participants, they found a significant gender effect over moral acceptability.

In detail, results revealed that those genotype combinations improving dopaminergic signalling increased moral acceptability in women, in a way to make their responses more similar to those given by men. The authors interpreted this result by hypothesizing that an increase in dopamine availability could reinforce the cognitive strategies at the expense of the emotional processing usually adopted by women during decision-making, thus favoring a more rationally-driven decision process.

For what concerns risk-taking in economic decision-making, several studies have shown that the dopaminergic projection from the ventral tegmental area to the ventral striatum is particularly important in reward processing showing the relevance of the dopaminergic pathway in this frame.<sup>13</sup> However, contrasting results are reported in the literature about the role of dopamine receptors genotypes in economic decision-making.<sup>14</sup> For example, Dreber and colleagues found that a genetic variation of a dopaminergic receptor was associated with higher risk-taking propensity only in the men sample.<sup>15</sup>

A few brain-imaging studies have investigated the neural brain activity in subjects, who were asked to make moral choices referring to various scenarios<sup>16</sup> focusing on the relationship between emotional processing and moral judgments.<sup>17</sup> For example, Greene and colleagues demonstrated that both cognitive and emotional neuro-functional mechanisms are involved in decision-making processes, sometimes even with mutually competitive roles.<sup>18</sup> In fact, in their experiment, they found that solving difficult personal moral dilemmas with personal moral violations triggered specific brain areas typically recruited during abstract reasoning and cognitive control, such as the dorsolateral prefrontal cortex (DLPFC) and the anterior cingulate cortex (ACC). In attempting to explain the role of cognitive and emotional mechanisms in moral judgment, the authors suggested a dual-process theory.

They described two different and competing neurological systems: a slow and conscious cognitive system and a fast and uncon-

scious affective system.<sup>19</sup> The former involves a conscious and rational appraisal of facts that produces a utilitarian response. For this reason, the system is supposed to be active when personal and emotional involvement is reduced. On the other hand, the latter engages affective responses and is the result of being emotionally involved in the situation. In this case, responses tend to be non-utilitarian.

### Utilitarian choices and altruism

The term utilitarian judgment indicates a deliberative thinking oriented at achieving the greatest utility. The decision is taken following a calculation that requires to assign values to the benefits and harms resulting from an action and to compare them with the benefits and harms that might result from other actions. Conversely, non-utilitarian decision-making involves intuitive and not rational thinking. For example, when responding to moral dilemmas, participants have to choose whether to sacrifice one person in order to save the lives of a greater number.

According to the definition above, and following a utilitarian reasoning, one might decide that breaking the fundamental moral principle “do not deliberately harm someone” could be the best option in order to increase the utility for the greatest number of people.<sup>20</sup> Then, it seems evident that utilitarianism is anyhow connected to altruism since it considers the benefits for the whole context and not just within an individual frame. However, it is mostly related to the so-called effective or “optimal altruism”, a definition referring to a rational use of evidence and reasoning to define the best way to help others.<sup>21</sup> Thus, to sum up, we can follow an intuitive reasoning leading to traditional altruism (or charity), or a rational reasoning.

This can lead to a utilitarian choice, which is moved by external incentives, or to an optimal altruistic (or endogenous) decision, which is moved by internal incentives. The effects related to optimal altruism last

longer than the effects of utilitarian choices. In fact, optimal altruistic behaviors can be sustained indefinitely by the self, while utilitarian behaviors can only be sustained by something outside the self. The external incentives, such as monetary rewards, in fact, decay more rapidly than internal incentives. Thus, optimal altruism needs internal motivation.<sup>22</sup>

When facing a moral dilemma, people show to be utilitarian when facing an emotionally non-salient decision, or in the so-called “impersonal” moral dilemma. Conversely, when choice involves, for example, inflicting a direct harm to one person in order to save other people’s lives (which is exactly what is required to do in the so-called “personal” moral dilemmas), many people decide not to do any action or at least to act in a condition of high emotional conflict.<sup>23</sup> But what impersonal and personal actually mean?

The prototypical example of an impersonal moral dilemma is the trolley dilemma.<sup>24</sup> The scenario involves a runaway trolley that is going to hit five people who will be killed if it proceeds on its current way. The only possibility to save them is to pull a switch that will deviate the trolley towards another railway, where it will kill only one person, instead of five. In this condition, people generally say “Yes, I would pull the lever”.<sup>25</sup> On the other hand, most people say no to the footbridge dilemma.<sup>26</sup> The scenario is the same as in the previous example, but to deviate the trolley the subject is asked not to switch the lever, but to push an overweight stranger from a footbridge standing the tracks, towards the oncoming trolley to stop it and save the five people.

The trolley dilemma, unlike the footbridge dilemma, is defined as “impersonal” since it is more “editing” rather than “authoring” in first person. From a philosophical perspective, a possible explanation of such choices from the subjects could be that personal dilemmas involve a violation of Kant’s practical imperative, namely that humans must never be used as a mere means for someone else’s purpose, but only as a target.

As said above, personal moral judgments

are associated with the recruitment of the affective system, whereas impersonal conflicts are more related to the cognitive system. In order to find scientific basis of this assumption, Greene and colleagues used the fMRI technique and found that when dealing with personal dilemma a significant activation involving emotional areas emerged, as compared to impersonal scenarios.<sup>27</sup>

Several sources of evidence came out in literature to support the dual-process hypothesis. Some studies demonstrated that participants’ willingness to endorse utilitarian actions that require personally harming an innocent can be affected by variables that influence brain functioning.<sup>28</sup> For example, the role of serotonin appeared to be linked to utilitarian outcomes by enhancing the aversive emotional response to causing others’ harm.<sup>29</sup> Some other studies focused on the role of controlled cognition, meant as the capability of deliberately sizing up about something. In some of them, imaging results revealed that the behavioral outcomes in terms of frequency and reaction times were modulated by specific networks related to controlled cognition for utilitarian choices,<sup>30</sup> for time pressure and for cognitive load.<sup>31</sup>

## Gender differences in decision-making

The psychological groundwork of moral psychology lies in Piaget and Kohlberg’s theories. In his theory, Piaget<sup>32</sup> assumed that moral stages are universal, and their development is invariable. Later, in addition to these assumptions, Kohlberg<sup>33</sup> asserted that morality is universal, equal for men and women and for all cultures. This idea has nevertheless been repeatedly questioned.

The role of factors such as gender, education, and religion opens the more general question: “is morality innate or is something people learn?”.<sup>34</sup> Thus, one of the major factors considered in evaluating moral reasoning and behavior is gender.

Currently, it is well-known that men and women react differently to emotions, with

women being more accurate in processing and labeling, for example, emotional faces.<sup>35</sup> Similarly, Thayer and Johnson<sup>36</sup> found females as being more accurate in recognizing facial expression compared to men. Such differences have also been related to neuro-anatomical differences in brain networks devoted to affective processing, considering, for example, the wider grey-matter volume in specific parts of the limbic system.<sup>37</sup> Thus, considering the crucial role of the emotional involvement in decision-making, it could be of great interest to explore also gender differences. In fact, previous research already demonstrated the influence of such emotional “female advantage” over other cognitive processes.<sup>38</sup> For example, Canli and colleagues<sup>39</sup> revealed a better memory performance for highly emotional events in women than men, while Burton and colleagues<sup>40</sup> demonstrated that the affective content had a more negative effect on memory in female participants, compared to males.

Previous research investigating gender differences in moral reasoning has been limited primarily to behavioral techniques such as coding verbal responses to hypothetical moral dilemmas.<sup>41</sup> In particular, research on moral decision-making is now mainly considering how exactly gender differences are manifested in moral judgment. It is a common belief that women are more often inclined to sentimentalism, to intuition, and to emotions than men. This line of research is usually traced back to Kohlberg’s six-stage theory of moral reasoning and Gilligan’s opposing work,<sup>42</sup> which criticized Kohlberg’s theory as being biased in favor of men. As already discussed by Capraro and Sippel,<sup>43</sup> in his theory Kohlberg asserted that the moral development, and more precisely the development of one’s explanations of one’s moral actions, occurs on six stages: every new stage that an individual achieves increases his own capabilities to respond to moral dilemmas.

According to Gilligan, Kohlberg stated that women frequently get stuck at the third level of this development, defined as post-

conventional morality, where individual judgment is based on self-chosen principles, and moral reasoning is based on individual rights and justice. Conversely, men more often move forward to the abstract principles of morality. While men solve moral dilemmas involving rational reasoning, respecting law and order, women seem to be mostly driven by emotions, empathy and care for others. This led Gilligan to define two divergent modes of moral reasoning: an ethic of care and an ethic of justice. Studies led by Aldrich and Kage<sup>44</sup> and Björklund<sup>45</sup> seem to confirm the existence of these differences. The first is thought to be more based on universal principles and rules, while the second involves concepts like involvement, relations and the role of others. The role of gender has thus been discussed in terms of “justice-care” dichotomy.

Moreover, Bussey and Maughan<sup>46</sup> showed a significant difference in the evaluation of gender-specified moral agents by men but not by women. On the other hand, Garwood and colleagues<sup>47</sup> found no gender effects at all. The reasons underlying these effects can be found by considering a social-evolutionary perspective.

In fact, as suggested by Rand and colleagues,<sup>48</sup> social roles can be significant in this case. Women are expected to adopt more collective and altruistic behaviors, while men are supposed to be more assertive and independent.<sup>49</sup> According to these stereotypes, previous research found that when women behave contrarily to these ideas and are, then, perceived as insufficiently kind, generous, communal, they are liked less in general, but they are also less welcomed in the workplace.<sup>50</sup> So, women are more expected to behave altruistically.<sup>51</sup> In second instance, these expectations actually lead women to habituate to being altruistic and to behave in a less utilitarian way.

More recently, some neuroscientific studies tried to shed light on gender-related differences in neural networks recruited by moral decision-making. Since behavior can

be considered as the result of all neural activity, neuroimaging could be used to assess whether men and women show differences in brain region activation in moral reasoning and if utilitarian choices show specific neural patterns.<sup>52</sup> Indeed, functional neuroimaging studies have identified a consistent set of brain regions involved in processing different types of moral stimuli including moral dilemmas, statements, and pictures.<sup>53</sup>

More recent studies showed that men override intuitive moral options in highly emotional and difficult moral dilemmas more often than what women do.<sup>54</sup> This indicates that men are more willing to deal with rather pragmatically moral trade-offs despite the risk of harm for others.

On the other hand, women seem to be more empathetic and to care for others at risk. Youssef and colleagues<sup>55</sup> demonstrated that, during stressful situations, females tend to make less utilitarian moral decisions than males. Scheele and colleagues<sup>56</sup> reported behavioral data supporting the different impact of oxytocin on self-processing in women and men. They found out that changing the amount of this hormone led male subjects to more strongly endorse self-benefit outcomes in moral dilemmas, but did not influence decision-making in ones without a self-benefit outcome or involving non-moral contexts. By contrast, in women, oxytocin led the behavior toward other-regarding preferences, with self-benefit dilemmas being less endorsed and the reaction time difference between accepted and rejected self-benefit dilemmas being increased.

Interestingly, in a recent meta-analysis, Armstrong and colleagues<sup>57</sup> discussed the gender effects related to the use of deontological principles, which derive from moral rules and utilitarian principles that maximize overall outcomes. The results of their analysis revealed that women show higher scores for deontological tendencies than men.

Besides the gender differences related to moral decision-making, much of the previous evidence about the presence of different

choice styles has also focused on risk-taking behavior in economic scenarios. In particular, one of the most recurring results is that women might be less risk-seeking and more risk averse than men.<sup>58</sup> However, it also seems that in the attempt to maximize their gains, men take more risky decisions, but also pay more for the consequences of their choices.<sup>59</sup>

To explore risk-taking behaviors in uncertain conditions, previous research implemented specific computerized tasks which simulate decision-making.

The *Iowa Gambling Task* (IGT)<sup>60</sup> is one of the best known in the literature. It is a card game in which subjects are presented with four decks of cards. Each of them can either reward or penalize them in terms of game money. The aim of the game is to win as much money as possible. However, the four decks differ based on the balance of gain/loss cards. Thus, there are “bad decks” and “good decks”.

Typically, after about 40 or 50 selections, participants are rather good at identifying the good ones. Previous research, however, revealed that women perform more poorly than men<sup>61</sup> since they exhibit more loss averse behavior in the task by avoiding the advantageous decks, which are accompanied by possible big losses. Other perspectives, however, underlined the importance of focusing on the existing differences in information processing to frame the distinct decision-making behaviors.<sup>62</sup> In detail, it seems that men attend more to global information by focusing on a single relevant information, while women consider multiple aspects of a problem.<sup>63</sup> For example, in the IGT, women consider the frequency of both rewards and penalties of each deck, as well as the overall pay-off.<sup>64</sup> On the other hand, men decide based more on the long-term payoff of each deck considered alone.

Finally, another possible frame where gender was considered as a significant variable for decision-making is shopping.<sup>65</sup> For example, previous studies highlighted an ef-

fect of gender over the involvement in Christmas shopping.<sup>66</sup>

Moreover, gender stereotypes proved to be correlated with memory tasks. Specifically, it has been shown that women are more efficient at memorizing grocery than geographical directions. The same did not apply to hardware shopping lists.<sup>67</sup> Also, neuroimaging studies highlighted the presence of specific neural networks in men and women when choosing groceries.<sup>68</sup> In summary, at present, there is evidence about the presence of significantly different decision-making behaviors between women and men in different real-life contexts. Also, as reported by a recent meta-analysis,<sup>69</sup> it seems that different experimental conditions can significantly modify the choice behaviors in man and women.

### **The present study: Aims and hypotheses**

We developed our experimental hypotheses starting from the consideration that men and women may show different attitudes in deciding to accept or refuse some offers when exposed to scenarios with or without a moral subject. Thus, we proposed three adapted versions of the Ultimatum Game,<sup>70</sup> a popular instrument used in economic experiments, set in economic, moral or shopping scenarios.

The first aim was to compare the acceptance rates in these different contexts. According to what discussed so far, and thanks to the presence of intrinsic motivations, we expected a general higher acceptance rate for the moral condition.

The second aim was to compare the choice behaviors between unfair and fair offers, for which we hypothesized a higher acceptance rate according to a maximization of utility. Moreover, we were interested in combining these variables with gender differences. Here, we expected a higher number of accepted offers in the economic and shopping scenarios by men since these choices could be guided by more extrinsic than intrinsic motivations that could lead to a more rational reasoning.

Finally, we were interested in examining the correlation between choices and risk-taking attitudes. In particular, we expected the presence of specific differences in the combination of personality attitudes, gender, and decision-making scenarios.

## **Methods**

### *Participants*

202 volunteers participated in the experiment. Three of them were excluded due to data incompleteness. Thus, the final sample included 199 participants, 137 women and 62 men of comparable age ( $M_{\text{females}} = 22.9$ ;  $SD = 6.2$ ;  $M_{\text{males}} = 21.9$ ;  $SD = 2.8$ ). The experiment was conducted in accordance with the Declaration of Helsinki and all the procedure were carried out with an adequate understanding of the subjects. No payment was provided.

### *Procedure*

The experiment was inspired by the Ultimatum Game (UG) and built up using the same structure. Thus, there was a hypothetical bidder who made some different proposals that participants were asked whether to accept or not. According to the original paradigm, subjects were informed that, in case they did not accept, both parts would have lost the amount of the payoff. Participants were first asked to read carefully the instructions.

The questionnaire was composed of different hypothetical situations framed in 3 scenarios: economic (E), moral (M) and shopping (S). In the E situation, the scenario described the story of a work colleague asking for help with an extra-work that could lead to extra money. Participants were also informed that, after accepting the job, the contribution from the two parts was substantially equal. After that, they were required to accept or refuse some possible offers from the colleague about how to split the earned money, which consisted of € 1000. In the M

condition, participants were required to imagine a situation in which they won a special bonus at work in addition to their usual salary. However, in order to help a colleague in times of need, they were proposed by their boss to split this bonus with a beneficial association, which supported his son/daughter fighting against leukemia.

Finally, in the S scenario, participants were presented with a situation in which they could benefit from a voucher offered by a colleague and valid only in an affiliated shop for the same day. In this case, participants were required to accept or refuse some offers related to a shirt they wanted. In all cases, they were reminded about the fact that if they had rejected the offer neither of the two parts would have obtained anything. Each situation involved 3 other types of offers, that were presented in a randomized order within each condition. The offers could be neutral (N) or unfair. In the case of a neutral proposal, the money of the E and M situations was equally distributed between the two parts (50%/50%), while in S the tendency to use the voucher was encouraged by the fact that the shirt was not exactly the one desired, but very close in colour.

For what concerns, instead, the unfair conditions, they could be of two kinds: downwards (D) or upwards (U) in relation to the bidder. In detail, for E and M conditions, the D offer led to a disadvantage for the subjects (20% vs. the 80% for the colleague or the association), while the U offer proposed the opposite outcome. For the S condition, instead, the D offer consisted in using the voucher for an imperfect shirt, while the U offer allowed using the voucher for a shirt that, by mistake, was more expensive than it was written on the price tag.

Thus, the questionnaire was composed by 9 sections, 3 for economic (E), 3 for moral (M) and 3 for shopping (S) situations, with neutral (N), downwards (D) or upwards (U) offers. The completion required about 20 minutes. Participants had to take a choice by crossing the proper answer to accept or refuse the offer.

## BRET

The Bomb Risk Elicitation Task (BRET) is an intuitive task aimed at measuring risk attitudes. Subjects decide how many boxes to collect out of 100, one of which contains a bomb. Earnings increase linearly with the number of boxes accumulated but are zero if the bomb is also collected. The BRET requires minimal numeracy skills, avoids truncation of the data, allows the precise estimation of both risk aversion and risk seeking, and is not affected by the degree of loss aversion or by violations of the Reduction Axiom.<sup>71</sup>

## Results

### ANOVAs

To explore the tendency to accept or refuse offers across the different experimental conditions, the number of “accepted” answers was transformed into percentages and used as dependent variable in a mixed-design ANOVA, with Condition (3: E, M, S) and Offer (3: N, D, U) as repeated factor, and gender (2: M, F) as between factor.

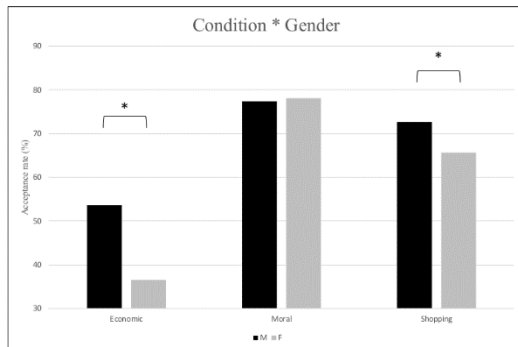
Results showed a significant effect for *Condition* ( $F(2,376) = 101.75$ ;  $p < 0.001$ ;  $\eta^2_p = 0.35$ ). Paired multiple comparisons revealed that judges were more inclined to accept offers within the M condition ( $M = 77.76\%$ ;  $SD = 2.26$ ) than the E ( $p < 0.0001$ ;  $M = 45.11\%$ ;  $SD = 2.1$ ) and the S ( $p < 0.005$ ;  $M = 69.15\%$ ;  $SD = 1.83$ ) condition. In addition, the S condition triggered a significantly higher accept rate than the E one ( $p < 0.005$ ;  $M = 69.15\%$ ;  $SD = 1.83$ ).

Also, the analysis revealed a significant *Condition \* Offer* effect ( $F_{4,752} = 42.05$ ;  $p < 0.0001$ ;  $\eta^2_p = 0.18$ ). Post-hoc comparisons revealed that in the E task, N offers ( $M = 80.5\%$ ;  $SD = 2.43$ ) were accepted more than U offers ( $M = 36.03\%$ ;  $SD = 3.38$ ), which, in turn, were accepted more often than the D ones ( $M = 18.79\%$ ;  $SD = 2.73$ ) (all  $p < 0.0001$ ). On the other hand, in the M task, the N offers ( $M = 87.83\%$ ;  $SD = 2.32$ ) were accepted more often than both ( $p < 0.0001$ ) unfair offers ( $M_D = 72.09\%$ ;  $SD = 3.22$ ;  $M_U = 73.36\%$ ;



SD=3.29), which did not differ each other. Finally, in the S task, N ( $M=74.47\%$ ;  $SD=2.53$ ) and U ( $M=72.03\%$ ;  $SD=2.72$ ) offers were both accepted significantly more often than the D ones ( $M=60.96\%$ ;  $SD=2.42$ ).

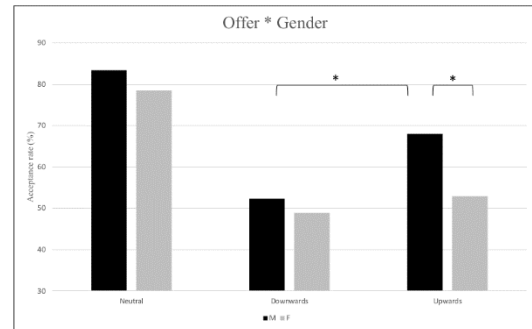
Interestingly, responses in the different conditions were also modulated by Gender, as revealed by the significant *Condition \* Gender* interaction ( $F(2,376)=7.12$ ;  $p<0.005$ ;  $\eta^2_p=0.04$ ). Post-hoc comparisons revealed that men were more inclined to accept E offers ( $M=53.67\%$ ;  $SD=3.47$ ) than women ( $p<0.001$ ;  $M=36.54\%$ ;  $SD=2.33$ ). Similarly, they were more inclined to accept S offers ( $M=53.67\%$ ;  $SD=3.47$ ) than women ( $p=0.05$ ;  $M=72.66\%$ ;  $SD=3.04$ ). No significant differences emerged for the M situation.



**Fig. 1:** Acceptance rates in men and women as revealed by the Condition \* Gender effect.

Moreover, the analysis revealed a significant effect for *Offer* ( $F(2,376)=116.08$ ;  $p<0.001$ ;  $\eta^2_p=0.38$ ). Paired multiple comparisons revealed that fair offers were more often accepted ( $M=80.93\%$ ;  $SD=1.71$ ) than U offers ( $p<0.001$ ;  $M=60.47\%$ ;  $SD=2.2$ ) which, in turn, were more often accepted than D offers ( $p<0.001$ ;  $M=50.61\%$ ;  $SD=1.87$ ). Such an effect was also modulated by Gender, as revealed by the significant *Offer\*Gender* interaction ( $F(2,376) = 7.12$ ;  $p<0.005$ ;  $\eta^2_p=0.04$ ). Post-hoc comparisons revealed that men were more inclined to accept U offers ( $M=68.02\%$ ;  $SD=3.66$ ) than women ( $p<0.005$ ;  $M=52.93\%$ ;  $SD=2.46$ ). Moreover, men accepted significantly ( $p<0.0001$ ) more often U ( $M=68.02\%$ ;

$SD=3.66$ ) than D ( $M=52.32\%$ ;  $SD=3.11$ ) offers, while the effect was not significant for women ( $M_U=52.93\%$ ;  $SD=2.46$ ;  $M_D=48.91\%$ ;  $SD=2.09$ ).



**Fig. 2:** Acceptance rates in men and women as revealed by the Offer \* Gender Effect

## Correlations

Pearson's correlation analysis was applied to every dependent variable, including the acceptance percentage in every condition, with regard to BRET scorings. With regard to the E task, results showed a positive correlation between BRET scorings and the number of accepted D offers ( $r=0.24$ ;  $p<0.01$ ) for women, and a negative one between BRET and the amount of accepted U offers ( $r=-0.33$ ;  $p<0.05$ ) for men. For what concerns the M task, instead, results showed a positive relation between BRET scorings and the number of accepted N offers ( $r=0.19$ ;  $p<0.01$ ) for women, and a negative correlation between BRET and the number of accepted N offers ( $r=-0.29$ ;  $p<0.05$ ) for men.

## Discussion and conclusion

The present study aimed at investigating the decision-making behaviors of men and women during three different scenarios of the Ultimatum Game, including or not including a moral component, as well as fair and unfair offers. In so doing we wanted to test if gender differences might modulate moral and economic decision-making, within the frame of utilitarianism. In fact, it de-

scribes very well how the evaluation of costs and benefits may similarly determine human decisions in a variety of domains.<sup>72</sup> It is well known that utilitarian and non-utilitarian decisions may be linked to the recruitment of two different thinking systems,<sup>73</sup> one slow and reflective (system 2) and the other fast and intuitive (system 1). In this sense, utilitarian decisions should involve system 2, thus leading to more reflective and less intuitive decisions in evaluating both economic and moral dilemmas.

However, this rational system does not rely simply on pure data and well-designed algorithms, but it is still influenced by a number of biological, subjective, contextual and cultural factors so that we can state each decision is the consequence of a balanced cognitive functioning.<sup>74</sup>

Indeed, if we may suggest that utilitarian decisions need reflection, in prosocial contexts humans often show to be intuitively altruistic, even if altruism is generally associated with system 2 instead of system 1.

This may be due to the fact that altruism is often advantageous in the social context and so we become altruistic thanks to a learning process that may involve an intuitive mechanism that Rand and colleagues called Social Heuristics.<sup>75</sup> This learning process could perhaps explain gender-related differences, since women are often described to be more altruistic in real-life conditions, probably because of a higher social heuristics sensibility.<sup>76</sup> Thus, it is important to deepen our knowledge about the factors that may modulate human decisions. According to the abovementioned assumptions, we designed the present study to analyze how biological and cultural gender-related differences may affect the evaluation of some simple decision scenarios.

A first significant result highlighted the presence of higher acceptance rates for the moral scenario. This was an expected result since we wanted our three conditions to be differently considered by responders based on their content. We believe that the moral

scenario affected subjects' responses, pushing for offers acceptance independent of any other contextual factors.<sup>77</sup> In this context, in fact, our aim was to push participants to think about ethical obligations to others instead of more general considerations about perceived fairness or unfairness of offers. We found this effect to be significant both for men and for women since all participants showed a similar response pattern.

In particular, the moral scenario led to a higher number of acceptances respectively for neutral (N), advantaging (U) and disadvantaging (D) offers.

Moreover, as a second result, an interaction effect between condition and offer emerged, showing that in the economic scenario, fair (N) offers were accepted more than advantaging (U) offers which, in turn, were accepted more often than disadvantaging (D) offers. In the moral scenario, instead, fair offers were accepted more often than unfair offers (both advantaging and disadvantaging that did not differ from each other). Finally, in the shopping task, fair and advantaging offers were both accepted significantly more often than the disadvantaging offers.

A third significant result revealed how the evaluation of the decision scenario may be modulated by gender-related differences: in fact, although the moral scenario led to the same acceptance rate in both genders, economic and shopping offers were more likely to be accepted by men than women. Following the Social Heuristics Hypothesis (SHH)<sup>78</sup> one would expect to find gender-related differences, especially in moral dilemmas. However, we argue that the SHH is particularly useful to find out differences in a situation much similar to everyday life, while we used a quite artificial setting probably not so efficient in triggering the Social Heuristics and the related prosocial behavior.

Instead, we could suggest that the differences found between men and women in economic scenarios might be linked to a different level of data processing. In particular, it seems that men were more inclined to pur-

sue a sort of optimal (effective) altruism when evaluating economic tasks.<sup>79</sup> Differently from the intuitive altruism described by the SSH, optimal altruism is a prosocial behavior that considers the proper means that may be applied in a given context, so considering the obligation to others needs in a rational way. In this sense, optimal altruism implies a utilitarian reasoning and the activation of thinking system 2. This way, in our experiment, male participants obtained on average a higher gain.

We might argue that men considered the economic scenarios in a more reflective way, while women often relied their decisions on intuitive evaluation, thus being vulnerable to the negative emotions elicited by unfair offers. This is coherent with a vision of women as being more affected by prosocial considerations in everyday life situations. However, we can also offer other interpretations. First of all, since we used an ultimatum game paradigm, the differences we found might be due to a different consideration of risk. Since women are generally reported to be more risk averse than men,<sup>80</sup> we might think that women interpreted unfair offers as potential risks to avoid. Of course, we might also hypothesize that female participants were less cognitively involved in economic tasks and that this fact prevents them to reflect properly on the decision to take. Actually, some studies reported women to be more affected by the specific characteristics of the experimental condition or task.<sup>81</sup>

At this regard, though we did not find any significant difference between men and women in risk propensity as measured by BRET, our correlational analyses revealed that in the economic task a higher risk-taking propensity was associated with a higher acceptance rate of disadvantaging offers in women, and a lower acceptance rate of advantaging offers in men. On the other hand, with regard to the moral scenario, a higher risk-taking propensity was associated with a higher acceptance rate of fair offers in women, and lower acceptance rate for men.

Finally, another significant finding emerged about the type of offer. According to our expectations, in fact, fair (N) offers were more likely to be accepted. These offers, in fact, are those that maximize utility, since both parts can access half of the disputed goods. However, this effect was differently modulated in men and women. In fact, men were more inclined to accept advantages (U) offers than women. They also accepted more often advantaging (U) than disadvantaging (D) offers. Women, on the other side, equally accepted U and D offers, meaning that in the case of an unfair offer, they accepted or refused them in a similar way, whether gaining or losing more money than the alleged opponent.

This fact may be considered as the result of a cognitive process aimed at maximizing the final monetary outcome for both parts (i.e. it would be a utilitarian behavior), even if it implies the acceptance of a social inequality. It's also important to underline that men tried to avoid perceived losses. Instead, women did not show this asymmetric pattern. These results may be modulated by the risk-taking propensity. Coherently with our data, Andreoni and Vesterlund<sup>82</sup> described a quantitative curve for altruism, since it seems modulated by a sort of price effect. Intuitively, it means that it is easier to be altruistic when it is cheap, while when altruism implies a higher price the altruistic decision becomes cognitively heavier. However, women and men seem to be differently affected by the price, with men being more altruistic when it is cheap, while women are more inclined to be generous when higher prices are implied. Our tasks, then, seems to be more congenial for male altruism.

To conclude, our data suggest the presence of gender differences in decision-making. Of course, our study presents some limitations that must be considered before attempting generalization.

First of all, the tasks we used are quite artificial and probably the cognitive processing is quite different than real-life situations. Second, it is well-known how gender differ-

ences in decision-making are often influenced by the specific features of the experimental conditions. So, it is possible that the same paradigm may lead to slightly different results changing the experimental set-up. However, these problems are quite common in psychological studies on moral decision-making. In addition, the sample presents some peculiarities, since women's group is bigger than men's one. Thus, future research should better consider this point for a more precise comparison.

Moreover, it is composed by young university students, while we might think that the age-related social learning might impact on moral as well as economics evaluations. Accordingly, age-related effects could be better explored in future contributions. Anyway, our results are strong enough to deserve attention both to suggest practical considerations and to stimulate future research. In particular, we argue that the presented data suggest that considering utilitarian decisions as the results of a reflective process is a simplistic vision. Utilitarian and non-utilitarian behaviors both involve the use of system 1 and system 2, so that the different factors related to the decision context may produce a specific balance. In particular, the role of gender in modulating the achievement of this balance seems quite strong. Men seem to be more rational in pursuing altruism while women are more intuitive and more oriented to human needs than economic considerations.

However, it is not clear if these effects are due to cultural-related biases, that push women and men to put attention on different aspects of life and to adopt different cognitive styles, or to biological differences. However, this question is rather misleading. In fact, it is quite difficult to distinguish between the effects of the cultural domain on the cognitive performance and, more generally, the complex interaction between cultural and biological factors, which cannot be excluded in the interpretation of gender-related differences.<sup>83</sup> Thus, though we argue that utilitarian and altruistic attitudes are differ-

ently modulated by task demands in men and women, we cannot state that these differences are more related to biological characteristics or to cultural biases.

However, we can argue that education and school programs might consider putting attention on the gender-related differences highlighted in this as well as other studies, both to reduce gender inequities and to exploit gender differences to empower decision-making skills in different domains.

## Notes

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<sup>3</sup> Cf. J. VON NEUMANN, O. MORGENTHAU, *Theory of Games and Economic Behavior*, Princeton University Press, Princeton (NJ) 1947, 2nd rev.

<sup>4</sup> Cf. Y. WANG, D. LIU, G. RUHE, *Formal Description of the Cognitive Process of Decision Making*, in: *Proceedings of the Third IEEE International Conference on Cognitive Informatics*, IEEECS Press, Victoria (Canada) 2004, pp. 124-130.

<sup>5</sup> Cf. R. PATTERSON, J. ROTHSTEIN, A. BARBEY, *Reasoning, Cognitive Control, and Moral Intuition*, in: «Frontiers in Integrative Neuroscience», vol. VI, 2012, Art.Nr. 114 - doi: 10.3389/fnint.2012.00114; J. DECETY, K.J. MICHALSKA, K.D. KINZLER, *The Contribution of Emotion and Cognition to Moral Sensitivity: A Neurodevelopmental Study*, in: «Cerebral Cortex», vol. XXII, n. 1, 2012, pp. 209-220.

<sup>6</sup> Cf. S.J. REYNOLDS, T.L. CERANIC, *The Effects of Moral Judgment and Moral Identity on Moral Behavior: An Empirical Examination of the Moral Individual*, in: «Journal of Applied Psychology», vol. XCII, n. 6, 2007, p. 1610-1624; J. MOLL, J. SCHULKIN, *Social Attachment and Aversion in Human Moral Cognition*, in: «Neuroscience & Biobehavioral Review», vol. XXXIII, n. 3, 2009, pp. 456-465.

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<sup>8</sup> Cf. D. CESARINI, C. T. DAWES, J. H. FOWLER, M. JOHANNESSON, P. LICHTENSTEIN, B. WALLACE, *Heritability of Cooperative Behavior in the Trust Game*, in: «Proceedings of the National Academy of Sciences», vol. CV, n. 10, 2008, p. 3721-3726; A. KNAFO, S. ISRAEL, R.P. EBSTEIN, *Heritability of Children's Prosocial Behavior and Differential Susceptibility to Parenting by Variation in the Dopamine Receptor D4 Gene*, in: «Developmental Psychopathology», vol. XXIII, n. 1, 2011, pp. 53-67.

<sup>9</sup> Cf. N.T. WALTER, C. MONTAG, S. MARKETT, A. FELTEN, G. VOIGT, M. REUTER, *Ignorance is no Excuse: Moral Judgments are Influenced by a Genetic Variation on the Oxytocin Receptor Gene*, in: «Brain and Cognition», vol. LXXVIII, n. 3, 2012, pp. 268-273.

<sup>10</sup> Cf. R.A. POLDRACK, *The Future of fMRI in Cognitive Neuroscience*, in: «Neuroimage», vol. LXII, n. 2, 2012, pp. 1216-1220.

<sup>11</sup> Cf. R. BACHNER-MELMAN, I. GRITSENKO, L. NEMANOV, A.H. ZOHAR, C. DINA, R.P. EBSTEIN, *Dopaminergic Polymorphisms Associated with Self-report Measures of Human Altruism: A Fresh Phenotype for the Dopamine D4 Receptor*, in: «Molecular Psychiatry», vol. X, n. 4, 2005, p. 333-335; K. ANACKER, S. ENGE, A. REIF, K.-P. LESCH, A. STROBEL, *Dopamine D4 Receptor Gene Variation Impacts Self-reported Altruism*, in: «Molecular Psychiatry», vol. XVIII, 2012, p. 402-403 - doi: 10.1038/mp.2012.49; N. EISENBERG, *Empathy-related Responding and Prosocial Behaviour*, in: «Novartis Found Symp», vol. 278, 2007, pp. 71-80.

<sup>12</sup> Cf. S. PELLEGRINI, S. PALUMBO, C. IOFRIDA, E. MELISSARI, G. ROTA, V. MARIOTTI, T. ANASTASIO, A. MANFRINATI, R. RUMIATI, L. LOTTO, M. SARLO, P. PIETRINI, *Genetically-driven Enhancement of Dopaminergic Transmission Affects Moral Acceptability in Females but not in Males: A Pilot Study*, cit.

<sup>13</sup> Cf. R.C. PIERCE, V. KUMARESAN, *The Mesolimbic Dopamine System: The Final Common Pathway for the Reinforcing Effect of Drugs of Abuse?*, in: «Neuroscience & Biobehavioral Reviews», vol. XXX, n. 2, 2006, pp. 215-238.

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<sup>21</sup> Cf. I. GABRIEL, *Effective Altruism and its Critics*, in: «Journal of Applied Philosophy», vol. XXXIV, n. 4, 2016, pp. 457-473.

<sup>22</sup> Cf. E. FEHR, U. GÄCHTER, *Altruistic Punishment in Humans*, in: «Nature», vol. CDXV, 2002, pp. 137-140 – doi: 10.1038/415137a; M.S. PEACOCK, S. MICHAEL, S. PETER, *Altruism and the Indispensability of Motives*, in: «Analyse & Kritik», vol. XXVII, n. 1, 2005, p. 188-196.

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<sup>24</sup> Cf. J.J. THOMSON, *Rights, Restitution, and Risk: Essays in Moral Theory*, Harvard University Press, Cambridge (MA) 1986.

<sup>25</sup> Cf. J.D. GREENE, L.E. NYSTROM, A.D. ENGELL, J. M. DARLEY, J.D. COHEN, *The Neural Bases of Cognitive Conflict and Control in Moral Judgment*, cit.

<sup>26</sup> Cf. J.J. THOMSON, *Rights, Restitution, and Risk: Essays in Moral Theory*, cit.

<sup>27</sup> Cf. J.D. GREENE, L.E. NYSTROM, A.D. ENGELL, J. M. DARLEY, J.D. COHEN, *The Neural Bases of Cognitive Conflict and Control in Moral Judgment*, cit.

<sup>28</sup> Cf. M. KOENIGS, L. YOUNG, R. ADOLPHS, D. TRANEL, F. CUSHMAN, M. HAUSER, A. DAMASIO, *Damage to the Prefrontal Cortex Increases Utilitarian Moral Judgements*, in: «Nature», vol. CDXLVI, n. 7138, 2007, p. 908-911.

<sup>29</sup> Cf. M.J. CROCKETT, L. CLARK, M.D. HAUSER, T.W. ROBBINS, *Serotonin Selectively Influences Moral Judgment and Behavior through Effects on Harm Aversion*, in: «Proceedings of the National Academy of Sciences», vol. CVII, n. 40, 2010, p. 17433-17438.

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<sup>31</sup> Cf. R.S. SUTER, R. HERTWIG, *Time and Moral Judgment*, in: «Cognition», vol. CXIX, n. 3, 2011, pp. 454-458; B. TRÉMOLIÈRE, W. DE NEYS, J.-F. BONNEFON, *Mortality Salience and Morality: Thinking about Death Makes People less Utilitarian*, in: «Cognition», vol. CXXIV, n. 3, 2012, pp. 379-384.

<sup>32</sup> Cf. J. PIAGET, *The Moral Judgment of the Child* (1932), Brace Jovanovich, Oxford.

<sup>33</sup> Cf. L. KOHLBERG, *Development of Moral Character and Moral Ideology*, in: «Review of Child

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<sup>34</sup> Cf. M. HAUSER, F. CUSHMAN, L. YOUNG, R. KANG-XING JIN, J. MIKHAIL, *A Dissociation Between Moral Judgments and Justifications*, in: «Mind & Language», vol. XXII, n. 1, 2007, pp. 1-21.

<sup>35</sup> B. MONTAGNE, R. P. C. KESSELS, E. FRIGERIO, E.H. F. DE HAAN, D.I. PERRETT, *Sex Differences in the Perception of Affective Facial Expressions: Do Men Really Lack Emotional Sensitivity?*, in: «Cognitive Processing», vol. VI, n. 2, 2005, pp. 136-141.

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<sup>39</sup> Cf. T. CANLI, J.E. DESMOND, Z. ZHAO, J.D.E. GABRIELI, *Sex Differences in the Neural Basis of Emotional Memories*, in: «Proceedings of the National Academy of the Sciences», vol. XCIX, n. 16, 2002, pp. 10789-10794.

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<sup>42</sup> Cf. L. KOHLBERG, *Stage and Sequence: The Cognitive-developmental Approach to Socialization*, in: D.A. GOSLIN (ed.), *Handbook of Socialization Theory*, Rand McNally, Chicago 1969; C. GILLIGAN, *In a Different Voice*, Harvard University Press, Cambridge (MA) 1982.

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<sup>44</sup> Cf. D. ALDRICH, R. KAGE, *Mars and Venus at Twilight: A Critical Investigation of Moralism, Age Effects, and Sex Differences*, in: «Political Psychology», vol. XXIV, n. 1, 2003, pp. 23-40.

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<sup>61</sup> Cf. K.I. BOLLA, D.A. ELDTRETH, J.A. MATOCHIK, J.L. CADET, *Sex-related Differences in a Gambling Task and Its Neurological Correlates*, in: «Cerebral Cortex», vol. XIV, n. 11, 2004, pp. 1226-1232; R. REAVIS, W.H. OVERMAN, *Adult Sex Differences on a Decision-making Task Previously Shown to Depend on the Orbital Prefrontal Cortex*, in: «Behavioral Neuroscience», vol. CXV, n. 1, 2001, pp. 196-206; J.A. WELLER, I.P. LEVIN, A. BECHARA, *Do Individual Differences in Iowa Gambling Task Performance Predict Adaptive Decision Making for Risky Gains and Losses?*, in: «Journal of Clinical Experimental Neuropsychology», vol. XXXII, n. 2, 2010, pp. 141-150.

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<sup>63</sup> Cf. C.L. WILLIAMS, W.H. MECK, *The Organizational Effects of Gonadal Steroids on Sexually Dimorphic Spatial Ability*, in: «Psychoneuroendocrinology», vol. XVI, n. 1, 1991, pp. 155-176; J.M. ANDREANO, L. CAHILL, *Sex Influences on the Neurobiology of Learning and Memory*, in: «Learning & Memory», vol. XVI, n. 4, 2009, pp. 248-266; L. CAHILL, *Why Sex Matters for Neuroscience*, in: «Nature Reviews Neuro-science», vol. VII, 2006, p. 477-484.

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<sup>72</sup> Cf. G.S. BECKER, *The Economic Approach to Human Behavior*, University of Chicago Press,

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<sup>79</sup> Cf. I. GABRIEL, *Effective Altruism and its Critics*, cit.

<sup>80</sup> Cf. C.C. ECKEL, P.J. GROSSMAN, *Men, Women and Risk Aversion: Experimental Evidence*, in: C.R. PLOTT, V.L. SMITH (eds.), *Handbook of Experimental Economic Results*, vol. I, Elsevier, Amsterdam / New York 2008, pp. 1061-1073.

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